STANDARD 3 – UPLAND VEGETATION HEALTH

> *Upland vegetation on each ecological site consists of plant communities appropriate to the site, which are resilient, diverse, and able to recover from natural and human disturbance.*

Vegetation in the Great Divide Basin report area varies from ordinary mixes of saline and sage-grass habitats to complexes of forest, mountain shrubs, sage-grass and riparian habitats around Ferris and Seminoe Mountains. An assortment of environmental factors influence the location(s), extent, seral stage(s), and/or types of vegetation found throughout the area. Elevation, precipitation zone, topography, soils and underlying parent materials, slopes, and exposures all contribute to the general vegetation composition and diversity throughout the assessment area. Various combinations of communities and limited inclusions within specific community types are common. The discussion of upland vegetation will be divided into two geographic regions, the Great Divide Basin and the Ferris-Seminoe Mountains with associated drainages.

1) Characterization:

The Great Divide Basin was once an inland sea, where layers of clays and sands were deposited through erosional processes that became the shale and sandstone derived soils we have currently. Mixed with these soil particles were salts, which with snowmelt and rainfall were leached down to varying depths depending on soil textures and the amount of moisture received. On clay soils, vegetative communities observed today tend to be more saline influenced and dominated by saltbush steppe or greasewood shrubland habitats. On sandy soils, where salts have been washed down into the soil profile, vegetative communities are dominated by big sagebrush/mixed grass habitats. Although most soils are deep, the depth to which salts have been leached in non-saline habitats is known as the effective rooting depth, and has a significant influence on the species and composition of plants found in various communities.

Big sagebrush/mixed grass communities are the most common vegetative communities found in the Great Divide Basin and the Rawlins Field Office. Wyoming big sagebrush is the principle variety, growing from six inches up to two feet in height at low to mid-elevations (picture 42-1). Above 6,500 feet (along Atlantic Rim) it is replaced by mountain big sagebrush, which has more of a flat-topped appearance and similar height. On deeper soils and often along drainages the dominant sagebrush is basin big sagebrush, which may grow from three to eight feet in height. Species commonly occurring with Wyoming big sagebrush are Douglas' rabbitbrush, winterfat, prickly-pear cactus, western and bluebunch wheatgrass, little and mutton bluegrass, bottlebrush squirreltail, Indian ricegrass, needleandthread, phlox, buckwheat, wild onion, Indian paintbrush, sego lily, groundsel, locoweed, and penstemon. Also found with mountain big sagebrush are snowberry, bitterbrush, serviceberry, mahogany, rubber rabbitbrush, Idaho and king-spike fescue, green and Columbia needlegrass, elk sedge, Kentucky and big bluegrass, lupine, larkspur, yarrow, sandwort, geranium and Oregon grape (picture 42-2). Basin big sagebrush is usually observed with Douglas' and rubber rabbitbrush, rose, snowberry, basin wildrye, green needlegrass, bottlebrush squirreltail, rhizamotous wheatgrass, and forbs listed with Wyoming big sagebrush.

Saltbush steppe habitat is found on flats and gentle slopes in upland positions. The dominant plant species is Nuttall's saltbush, that may grow in dense communities almost by itself or as a mixture with other species (picture 42-3). Plants found in these mixtures include birdsfoot sagebrush, bud sagewort, winterfat, Indian ricegrass, bottlebrush squirreltail, little bluegrass, thickspike wheatgrass, springparsley, biscuitroot, phlox, and mustards. In locations northwest of

Wamsutter, four-wing saltbush is common. Shadscale, another saltbush species, is found in low amounts in many areas. Black greasewood shrublands are found in lowland positions of the landscape where there is additional water, such as along drainages and playa and alkali lakes. Around playa lakes it is nearly a monoculture, otherwise it may be mixed with saltbush steppe species or with basin big sagebrush along drainages (picture 43-1). Understory species include those already listed for the two habitat types just mentioned.

Other plant communites found in this area are generally small in size and occur due to unique, localized conditions. On wind-blown rims, uplifts and ridgetops, vegetative communities are dominated by bluebunch wheatgrass or a mixture of grasses, mat-forbs, and sometimes birdsfoot sagebrush. These are classified as Very Shallow range sites in terms of effective rooting depth, that is limited by either bedrock or depth to higher soil pH. Other common species in addition to the two already mentioned are Indian ricegrass, little bluegrass, rhizamotous wheatgrass, phlox, buckwheat, sandwort, locoweed and penstemon.

Along Atlantic Rim are mountain shrub and aspen woodland plant communities. Aspen require deep, loamy soils and additional moisture. Because the wind direction in this area is primarily out of the west and southwest, snow is deposited on north to east slopes, providing habitats with extra moisture that can support aspen. Understory species include serviceberry, snowberry, creeping juniper, rose, Oregon grape, elk sedge, Columbia needlegrass, mountain brome, blue wildrye, elkweed, columbine, bluebells, geranium, arnica, licorice, bedstraw, and other forbs. Adjacent to aspen stands and still requiring extra moisture are stands of chokecherry and serviceberry, with many of the same understory species already listed for aspen sites. On the other side of the moisture spectrum are mountain shrub communities dominated by mountain mahogany. This species can grow in almost pure stands with primarily bluebunch wheatgrass, Indian ricegrass, balsamroot, buckwheat, groundsel, skyrockets and other forbs in the understory.

Plant communities in the Ferris-Seminoe Mountains area are much more diverse than the Great Divide Basin, with more influence by sands and limestone soils. On the south side of these mountains and extending northeast along Sand Creek are extensive sand dunes, both stabilized with vegetation and open, moving dunes. The vegetated areas are dominated by silver sagebrush with occasional pockets of basin big sagebrush, with shrub heights averaging two to four feet and taller along drainages (picture 43-2). Understory species include Douglas' and rubber rabbitbrush, needleandthread, prairie sandreed, Indian ricegrass, sand dropseed, scurfpea, dock, lupine, cryptantha, groundsel and buckwheat. In the open dunes about half of the surface area is occupied by blowout grass, an early successional species in the stablization process. A rare and unique plant, blowout penstemon, is found south of Bear Mountain on the north aspects of steeply sloping sand dunes. Smaller pockets of stabilized sands with similar species described above are also found on the north side of the mountain on deeper soils along drainages and south of the Sentinel Rocks.

On the benches and slopes on the north side of the Ferris-Seminoe Mountains are sandy to gravelly soils with shallow effective rooting depth that support low growing sagebrush/mixed grass communities (picture 43-3). Below 7,500 feet these sites are dominated by a mixture of Wyoming big sagebrush and black sagebrush, with shrub heights ranging from six to twelve inches. On some sites near Junk Creek there are nearly solid stands of black sagebrush. Understory species are primarily needleandthread, threadleaf sedge, and Junegrass, with lesser amounts of little bluegrass, bluebunch and thickspike wheatgrass, blue grama, phlox, locoweed, bitterroot, Indian paintbrush, sandwort and buckwheat. On the west end of the Ferris Mountain this site has increased amounts of mat forbs on shallow, wind-blown ridges. Above 7,500 feet near the edge of the mountain and reaching up the lower edge of the steeper slopes on the shallow

soils, the sagebrush dominant changes to Wyoming three-tip sagebrush. Understory species shift to Idaho and king-spike fescue, mutton bluegrass, Columbia needlegrass, buckwheat, balsamroot, bitterroot, shooting star, sandwort, locoweed, Indian paintbrush, phlox and mountain pea (picture 44-1).

Vegetation on deeper soils close to and on the mountains are dominated by big sagebrush, including all three varieties of Wyoming, basin and mountain. Description of heights, soils, and species are similar to that already described above. Sites supporting basin and mountain big sagebrush commonly have bitterbrush, snowberry and rabbitbrush as subdominants, but not as much serviceberry or chokecherry. One species found here and not seen further south is oceanspray. Varying amounts of limber pine and Rocky Mountain juniper are also found intermixed with the sagebrush communities on both Ferris and Seminoe Mountains. Extensive stands of mountain mahogany are located on the west end of Ferris Mountain (picture 44-2). In the same areas with mountain big sagebrush are small patches and stringers of aspen plant communities. Species found with aspen are similar to those described for Atlantic Rim, with the addition of Rocky Mountain maple. Encroaching into aspen woodlands are Rocky Mountain juniper, lodgepole pine and subalpine fir.

The stands of trees which cover most of Ferris Mountain are primarily lodgepole pine, and to a lesser extent subalpine fir at higher altitudes (picture 44-4). Douglas' fir and Engelmann spruce occur intermixed with subalpine fir along drainages. Lodgepole pine stands tend to have higher densities of trees than the other conifers, and therefore, have less diversity and lower production of understory species. Those commonly seen include grouse whortleberry, buffaloberry, pine reedgrass, arnica, wintergreen, prince's pine, dogbane, hawkweed and pine-drops. Subalpine fir grows in more open communities with sagebrush, creeping juniper, and a variety of grasses, sedges and forbs in the understory. Common species include elk and Ross' sedge, timothy, needlegrass, bluegrass, spike trisetum, pearly everlasting, pussytoes, sandwort, columbine, balsamroot, harebell, bluebells, violet, buttercup, groundsel, cinquefoil, fireweed, strawberry and yarrow. The Seminoe Mountains have more rocky and shallow soils that support mixtures of sagebrush and limber pine communities rather than denser forests (picture 44-3).

The granite formations found north of the Ferris-Seminoe Mountains are part of what's known as the Sweetwater Rocks, some of the oldest geologic formations in Wyoming. They appear as huge granite rockpiles, comprised of steep rock slopes, cliffs, and boulder fields, laced with cracks and canyons in various stages of fracturing and erosion. This results in an interspersion of small disjunct pockets, basins, slopes, and stringer drainages that support a mixture of vegetation types and species, some unique to these rocks. Species found here include limber pine, juniper, aspen, big sagebrush, black sagebrush, rabbitbrush, oceanspray, bitterbrush, currant, rose, snowberry, chokecherry, prickly-pear cactus, basin wildrye, bluebunch wheatgrass, needleandthread, Junegrass, Idaho fescue, little bluegrass, cheatgrass, sedges, pussytoes, cinquefoil, penstemon, larkspur, lupine, buckwheat, hairy goldaster, sandwort, cudweed sagewort, and various aster family species.

2) Issues and Key Questions:

Removal of vegetation and trends in species composition as a result of large ungulate grazers has been and continues to be the principal factor affecting vegetation. Domestic livestock grazing tends to provide the most impacts to the vegetation, primarily cattle currently and both sheep and cattle historically. This also includes trampling of vegetation along trails, fencelines and around watering facilities. Although localized portions of the assessment area (or specific vegetation

communities and/or species) may by more influenced by grazing or browsing of wild horses and wildlife.

Through varied management processes, including rangeland inventories, management agreements and grazing plans, and implementation of various "best management practices," stocking rates have been adjusted to fit available livestock forage on public lands throughout the Rawlins Field Office since the inception of the Taylor Grazing Act. Because of these adjustments, livestock management issues relate primarily to the season, duration, and distribution of use rather than stocking rates. The upland vegetative communities most often affected by livestock management are sagebrush/grassland and sagebrush-mountain shrub/grassland habitats in the form of the following impacts:

- Uneven use patterns (higher levels of grazing use close to reliable water sources or on gentle slopes as opposed to light grazing use when further from water or on steep slopes). Long duration and repeated livestock use adjacent to Bulls' Creek probably led to an expansion of prickly-pear cactus.

- Shifts in vegetation species types that favor increaser forage species (e.g., western wheatgrass) and aggressive warm-season annuals over cool-season, perennial vegetation types (such as bunchgrasses) where uninterrupted, season-long livestock grazing occurs.

- Variations in the availability of more desirable forage species due to season-long and/or growing season livestock use. Repeated, high use of these more favored species leads to their reduction or total removal from open, "easily accessible" locations (spaces between shrubs) to more protected, "sheltered" spots (e.g., under and within sagebrush and other shrubs.) This allows less desirable species such as rhizomotous, single-stalked grasses (e.g., western wheatgrass) to colonize and spread, thus lowering overall ground cover and forage value.

- Impacts to microbiotic soil crusts occur from grazing, roads, oil and gas development, and off-road vehicle use. The extent of these impacts and the ecology of species that occur in this region needs to be further monitored.

The key question that arises from these impacts focuses on implementation and refinement of best management practices for livestock grazing. What tools can be used or actions taken to implement or refine best management practices for livestock grazing that will maintain and/or improve the overall health and value of upland vegetation? What mix of grazing or browsing impacts can occur under the Bureau's multiple use mandate and still meet desired resource conditions? In country better suited to support winter sheep use (than summer cattle), what options are available for maintaining this type of use when the industry is currently depressed (picture 45-1)?

Vegetation use by wild horses occurs in the Great Divide Basin in the block public lands north of the checkerboard and west of Highway 287, and is managed only to the extent that the population of horses should be maintained at AML. In areas where wild horse populations exist within the watershed, impacts to vegetation from their grazing can be considered as important as those from livestock grazing to the health of the resource (picture 45-2). Because wild horse populations are restricted to only a portion of the analysis area, they could be considered to have less impact than the livestock grazing which occurs throughout the entire field office. Impacts to vegetation from wild horses are similar to those from livestock grazing in that they relate to

season, duration, and distribution of use, but also include stocking rates. The Lost Creek HMA was rounded up to reach AML in 2001 and the Stewart Creek HMA was rounded up to reach AML in 2002. Impacts from horse use are primarily to sagebrush/grassland habitats, and can result in heavy utilization levels, uneven distribution patterns, shifts in species types, and trampling and tearing up the ground. The key questions isto what extent should wild horses be managed to manipulate their distribution and seasonal use of vegetation? Asecond question concerns the established AMLs for both herd management areas; are the current AMLs the correct number of wild horses to manage for?

Policies that govern the use of vegetation treatments and the suppression of such vegetative community alterations, have played and continue to play an important role in the existing make-up and continual alteration of vegetation in the assessment area. Aggressive wildfire suppression, public perception over treating forest areas, and increasing concern of the risk levels to maintain control of treatments, has led to a predominance of late successional and lower productive shrub and woodlands, particularly in the Ferris-Seminoe Mountains area (picture 46-1). Additionally, aspen woodlands have declined in health and abundance, and conifer/juniper encroachment into these and other shrub stands appears to be increasing with time. A large percentage of sagebrush and mixed sagebrush/mountain shrub stands have reached a level of overly mature to decadent, leading to lower herbaceous ground cover, species diversity, plant vigor, forage, and nutritional value (for livestock and many big game wildlife species). Additionally, large, uninterrupted expanses of vegetation allow for large-scale losses of key habitat types if and when natural disturbances occur. The key question is how should the BLM and other natural resource management agencies/partners determine the level of vegetation treatment which should occur in order to promote better overall vegetation health while balancing the need for diversified habitat requirements of many user species? To what extent should portions of important vegetation communities be modified with treatments in order to improve the overall health of the larger ecosystem? At what level of vegetation alteration does temporary habitat loss outweigh long-term vegetation health maintenance and/or improvement?

The next most important factor relating to upland vegetation health throughout the watershed is use of varied vegetation resources by native wildlife, in particular, ungulate big game species. The principal issues that should be addressed regarding big game management relate to seasonal habitat forage requirements for mule deer, elk, and pronghorn antelope. Transitional, winter/yearlong, and crucial winter ranges for all species have traditionally been the habitats of concern (limiting the populations). Recent research has elevated the importance of quality spring/summer/fall habitat to healthy individual and population conditions. Key questions to be addressed include how to manage vegetation resources on key seasonal habitats to provide adequate quality forage for wildlife species, yet continue to provide forage for seasonal, managed livestock use. How can the mix of uses of the vegetation resource in the assessment area be managed so that vegetative health is maintained or enhanced?

Another influence on vegetation health is the presence and expansion of oil and gas field development, which is primarily in the checkerboard area around Wamsutter and pockets of activity around Hay Reservoir and Bairoil. Natural gas activity is expanding northward into the Red Desert and pilot projects for developing coalbed methane were initiated in 2000 on the west sides of both Seminoe Reservoir and Atlantic Rim. Short-term vegetation losses occur with every pad and access road that is constructed, but can be mitigated comparatively quickly with adequate reclamation after the initial activity subsides, sometimes to the point of increasing vegetative production over predisturbance levels. This can also be an opportunity to beneficially impact species composition and age class diversity. Good reclamation practices are generally the norm, but examples of poor, or unsuccessful reclamation attempts also exist. When reclamation is

unsuccessful or not attempted, impacts to vegetation are not limited only to direct changes (loss of vegetation on pad and road locations), but can expand to indirect impacts, including shifts in species composition and community diversity which appear in the form of increaser and/or invader species such as annual cheatgrass along road and pipeline right-of-ways and the spreading of halogeton, Russian thistle, and other weeds in oilfield road complexes. Additionally, seismic exploration has increased dramatically in the region. Although this exploration is supposed to be low impact, these activities do create new roads, which are then used and made more permanent by recreationists. The key question that should be addressed in regards to these impacts is how to elevate enforcement of reclamation standards in order to mitigate long-term impacts to the vegetation.

Finally, there is an increase in the expansion of unimproved roads and trails, and in the amount of off-highway vehicle (OHV) use throughout the field office area. This use is primarily associated with general recreational activities by the public rather than with development actions described previously (although those actions may alter the landscape in ways that encourage further OHV expansion.) The popularity and affordability of small, all-terrain vehicles leads to their use farther and farther into previously remote and roadless areas. This creats or "pioneers" unauthorized and illegal trails through the vegetation wherever possible. These routes are repeatedly traveled until vegetation is lost along the route, and it becomes a road for all practical purposes. The only barriers to this travel are terrain and hard to enforce rules governing off-highway travel. Only vegetation in the roughest topography is currently or potentially free from this disturbance. This disturbance leads to vegetation shifts and losses similar to those associated with the expansion of oil and gas exploration and extraction. However, the impacts extend into much longer-term time frames as there is no reclamation of the disturbance unless a pioneered road or trail is left to naturally revegetate through a lack of use. With ever-increasing recreational use of these lands, this rarely happens. Additionally, recreational OHVs are not subject to minerals management stipulations designed to mitigate the spread of weed seeds, and so have the potential to add weed infestation to their impacts. The key questions which should be addressed center around the need for the Bureau to decide if limits should be set which regulate off-highway vehicle use, what they should be, and how to effectively enforce these limits? Additionally, what educational tools should be employed to reduce impacts from recreational uses of public lands?

3) Current Conditions:

Quantifiable data about current vegetation conditions, health, and trends throughout the watershed varies as to availability, content, and quality. Upland monitoring information is available for varied grazing allotments and sub-basins within the watershed in the form of photo-points, aerial and basal cover transects, utilization studies, and other, more species and/or impact-specific studies. Studies vary by amount, type, and content throughout the assessment area in relation to the relative priority of the area/allotment, the level of management, and/or the urgency of determining specific impacts. Much of the monitoring efforts in the past focused on the collection of utilization information (what animals do to the plant), rather than on trend information (what the plant response is to animal use).

Vegetation and forage inventories of the assessment area occurred originally in the 1940s through the 1960s that led to stocking rate changes reflected in the current grazing permits. The most recent inventories were conducted in the mid- 1970s (Seven Lakes EIS) and in 1980-81 (Divide Grazing EIS). Seven Lakes was conducted using an order four soil survey and broader vegetative community classes, while Divide Grazing used an order three soil survey (smaller scale with greater definition) and the Soil Vegetation Inventory Method (SVIM) procedures. Data from these one-time inventories, based solely on species composition, suggested that rangeland health

conditions throughout the assessment area fell into the acceptable range, mostly rated as "good" condition, but including "excellent" and "fair" condition rangelands. The occurrence of "poor" condition rangeland was limited to small areas highly impacted by livestock such as historic sheep bedgrounds. Habitats such as aspen and conifer woodlands, greasewood playas, and mixed saline/non-saline ecotypes were not rated due to the lack of range site guide descriptions. Most of these habitats are believed to in good condition based on professional judgement, except for some of the woodland types. It should be noted that these inventories and associated conditional assessments were one-time snapshots of the vegetation communities and did not and/or have not been altered or updated to take into account trends in ecological vegetation conditions. In addition, use of 'range site guide descriptions' usually dropped the 'guide' part in rating communities. Since the guides tended to favor early to mid-successional (more grasses and forbs) plant communities, late successional communities dominated by shrubs received lower (fair) condition ratings. The following discussion is based on vegetative attributes, such as species composition, age class, cover and diversity of structure.

Species composition within the assessment area is comprised of 99+ percent native plants. Non-native plants are found in scattered spots where there was historic or recent disturbance. The most common species, cheatgrass, occurs on old sheep bedgrounds, salting areas, along roads, in and around the Sweetwater Rocks, and as a minor component in a number of plant communities. Other than in severely disturbed locations the perennial species appear to maintaining themselves without the expansion of cheatgrass, which is an annual. Other species like Russian knapweed and halogeton are found along roads or in isolated spots with recent disturbance, and are more thoroughly discussed in the weeds section of Standard #4. Crested wheatgrass has generally not been introduced on public lands in this area, except by the State of Wyoming Highway Department along highway right-of-ways and by oilfield companies around Bairoil for older road, pad, and pipeline reclamation. The crested wheatgrass found in these sites does not appear to be encroaching into adjacent native rangelands.

The most important concerns about species composition have to do with diversity and abundance of specific native plant species, namely aspen. Aspen is an early successional species. Due to the lack of fire, encroachment by conifers and sagebrush, and impacts of disease, decadence, and grazing, the acreage and health of aspen communities is declining. In the Ferris-Seminoe Mountains area, there are about 500 acres of aspen woodland habitat remaining, approximately 10 percent of what should be there. In the Atlantic Rim area, overall health of aspen communities is better. Although health trends are similar to the Ferris-Seminoe area, current acreage of these sites is still good. In addition, a recent prescribed burn in Jep Canyon has removed competing sagebrush and stimulated regeneration of aspen suckers (pictures 48-1, 48-2). Aspen growth on this prescribed burn is also being promoted by the rotational grazing system used on the Fillmore allotment. Disease is also widespread among the conifer species found on Ferris Mountain. White pine blister rust, mistletoe, and bark beetle infestations have killed many trees and are spreading across the mountain (pictures 48-3, 48-4).

Other concerns over species composition and cover relate to plant succession and grazing. In big sagebrush/mixed grass and mountain shrub communities, these two factors lead to increased cover of shrubs and reduced cover and composition of grasses and forbs. Due to the general lack of wildfires or prescribed burns in this area, most shrub communities are mature to old-aged. Historic grazing practices also led to shifts in plant species, with 'desirable' plants overused and reduced in abundance, while 'less desirable' or 'grazing tolerant' species increased in abundance. This is observed in the proportions of bunchgrasses (desirable) compared to plants like rhizamotous wheatgrass and little bluegrass (less desirable). Although less desirable increaser

species are present in varying degrees throughout the assessment area, in most cases, their presence does not indicate poor health or nonfunctional vegetation communities.

4) Reference Conditions:

Due to the lack of potable water or drainages to follow, the Great Divide Basin was essentially ignored by early explorers, so there is little written about this area in terms of the conditions that existed prior to settlement by white men.

5) Synthesis and Interpretation:

The vegetative resource in the Great Divide Basin and Ferris-Seminoe Mountains formed over thousands of years due to its geographic setting, climate, and animal use. Although there is not a lot written about the vegetation prior to impacts from settlement, much can be gleaned from analyzing the basic factors just listed. The Great Divide Basin lies between the Wind River Mountain range to the north and the Colorado Rocky Mountains to the south. It also straddles the Continental Divide with drainages to the west flowing to the Pacific Ocean and drainages to the east flowing into the Gulf of Mexico and the Atlantic Ocean. This gap in the mountains, where the Intermountain West meets the Great Plains, is reflected in a mixture of both climates and therefore, vegetation. The ecotone of vegetation produced by the overlap in these two zones, nearly two hundred miles across, is also influenced by the moderate, sustained winds that move through the gap in the mountain ranges. Peak moisture months are April through June, but with substantial amounts from March through October. This promotes a mixture of cool and warm season species, particularly in grasses. Although cool season grasses dominate, such as wheatgrasses, bluegrasses, and needlegrasses, there are increasing amounts from Rawlins eastward of blue grama, threeawn, prairie sandreed, sand dropseed and little bluestem. Yucca and sumac, more common to the plains, also show up in this area.

This mixture of plants was also modified by historic bison grazing. In the Reference conditions under Standard #4- Wildlife, there are journal entries by Fremont in 1842 about the bison herds in the Sweetwater River valley. Stansbury in 1850 also described the sign of bison in the Muddy Creek drainage south of the Great Divide Basin. And bison kill sites used by the Native Americans in this area also reflect their occurrence, and therefore, influence on native vegetation. The gap in the two mountain ranges obviously allowed bison to easily move from the Great Plains into the basin and further west. Bison may have contributed to the abundance of particular species. Threadleaf sedge, a low upland plant found on shallow, sandy soils, is common throughout central Wyoming. More adaptive to drought and close grazing, this species could have out-competed other species in habitats used by bison. Believed to be an 'increaser' species with cattle grazing, threadleaf sedge is as common in historic winter use pastures as those which have historically received growing season use by cattle.

The history of settlement by white men for this region followed that of the railroad, which arrived in 1867. The Sun Ranch on the Sweetwater River by Devils Gate was the first ranch established in the valley in 1872 and the Miller Ranch on the south side of the Seminoe Mountains began in 1873. Bison were killed for their hides and virtually eliminated from most locations by the late 1870s. In much of the West, early dominance of the livestock industry was by large cattle operators until the severe winter of 1886-87. This was not so much the case for the Great Divide Basin due to the lack of water. Sheep were trailed into Wyoming from the 1870s through 1905 to stock the range and were the principle use in the basin since sheep could get by on snow. Their use was generally late fall until early spring, when herds would be moved to the railroad for shearing so the wool could be easily shipped east to mills. Shearing corrals were located at short

distances along the line, such as Rawlins, Daley, Riner, Creston, and Wamsutter. John Niland spoke about how segregated it was even in those years, with separate corrals and shearing facilities based on the origin or religion of each outfit. Sheep were then moved to where there was good water and forage to lamb in the foothills before moving to forest lands (south) or Green Mountain (north) for the summer. Lambing areas in this report area would have been at Atlantic Rim, along Bulls and Lost Soldier Creeks in the Stewart Creek allotment, and in places around the Seminoes. The Ferris-Seminoe Mountains area tended to be a mixture of both sheep and cattle in the early years, and as allotments were fenced after the Taylor Grazing Act, became more dominated by cattle use. This transition to cattle use has continued through the years, with the Miller Ranch (Seminoe allotment) changing to all cattle in 1973 and the Moore Family (Stone allotment) changing in 2003.

Impacts from historic livestock use are most obvious where concentrated, repeated use took place, such as corrals, shearing areas, and bedgrounds. Bare ground, cheatgrass, and annual forbs are indicators of these sites. Locations are isolated and small in size. Change in rangeland condition on a broader scale include localized impacts with changes in species composition. Uplands adjacent to Bulls Creek have extensive patches of cactus, probably due to spring lambing and long duration use by wild horses and cattle next to a perennial water source. John Niland mentioned seeing more evidence of cactus in the Great Divide Basin in spots near water following years of livestock use near these sites. In a few locations at lower elevations where historic winter use pastures exist, desirable warm-season grasses like sand dropseed and green needlegrass still exist. However, in most areas that have received long duration of use by livestock during the growing season, these desirable grasses are not present. In many areas within the assessment area, low effective rooting depth and precipitation limit the potential for sagebrush or other shrubs to increase in cover and density if livestock use of grasses would promote expansion of shrubs. However, on deeper soils with ten inches or more precipitation, through both natural succession and livestock use of competing grasses, sagebrush can increase and dominate communities. In some sites, shrub cover may reach 60 to 70 percent cover. Some type of vegetative treatment is required at this point to reestablish a mixed community of grasses, forbs and shrubs. There were probably other historic impacts from livestock that are hard to recognize without any reference conditions, or where time has allowed rangelands to heal. However, dormant season-of-use in the Great Divide Basin and stable family ranches in the same locations for the past 50 to 120 years have lead to lower impacts and maintenance of natural plant communities over a majority of the area under evaluation.

Grazing use of vegetation is currently made by livestock, wildlife and wild horses. The majority of the assessment area is allotted to some form of livestock grazing use during various periods of the year (except the Morgan Creek watershed in the Seminoe Mountains). The vegetative resource is also utilized by wildlife use in its entirety, most notably by big game species (although in most cases, significant wildlife use is seasonal). Additionally, grazing use from wild horse herds occurs in the northern third of the Great Divide Basin. Impacts to vegetation from grazing can be expected to occur to measurable extents throughout the analysis area. Vegetation around Wamsutter and Bairoil are also impacted by extensive oil and gas field development, and an ongoing exploratory development for coalbed methane extraction is located on the west sides of Seminoe Reservoir and Atlantic Rim. Associated with this mineral extraction are networks of (mostly) improved roads.

Additional human uses of the watershed include commercial seed collection, off-highway vehicle use not associated with the previously-mentioned activities, the collection of moss-rock for commercial decorative purposes, and removal of wood products (pine, aspen and juniper) for firewood, fenceposts, and furniture. All of these activities influence the vegetative component of

the watershed where they occur, either indirectly via associated changes, or directly by contact with and/or removal of vegetation. Additionally, vegetation in the watershed is directly influenced by human activity through the application or repression of intentional and/or naturally occurring "vegetation treatments," including wildfire, prescribed fire, chemical, and mechanical vegetation removal.

As described and discussed previously, upland vegetative species within the Great Divide Basin and Ferris-Seminoe Mountains are likely very similar at present to that which would have been encountered prior to settlement of the area. The principal changes are in the type of animals, which utilize the resource, and the amount of disturbance (or lack thereof) that is levied towards the vegetation from other human activities. Sagebrush, sagebrush-grasslands, saltbush steppe, greasewood flats, and conifer woodlands continue to dominate the landscape throughout the watershed. The most obvious changes in vegetation on the landscape are evident where all or a portion of an existing community has been removed or "converted" to some other type. Examples of this include roads, well pads, mines, buildings, and agricultural conversion to irrigated hay meadows. Less obvious are changes within vegetation communities that have occurred naturally as communities evolve or have gradually been altered through the addition, subtraction, or manipulation of additional influences (e.g., a shift in vegetation consumed as traditional livestock uses are supplanted by animals with different dietary preferences and the suppression of wildfires).

Shifts in vegetation communities from historical conditions are to a large extent the result of use by grazing ungulates. Generally, grazing use throughout the watershed has placed pressure on developing vegetation through various portions of its seasonal life cycle. Winter use areas at lower elevations, where herded bands of sheep moved throughout the terrain in a nomadic fashion, tend to retain most of the desirable increaser forage species in a more available fashion, due to the timing and duration of use. Late spring and early summer grazing by cattle, sheep, horses, and/or big game wildlife species places the majority of grazing pressure on growing herbaceous material. As the summer 'hot season' progresses, cattle and wild horse use continues to primarily remove grasses, while sheep (where still present) and wildlife use tends to shift towards browse species on uplands. Fall and winter use by cattle, wild horses, and wintering elk herds, although still focused on grasses, removes mostly dead and dormant material, and sheep, pronghorn, and winter mule deer use removes portions of the summer's growth mostly on shrub species mixed with dried and desiccated forbs. More recent changes in composition that have occurred internally in various upland vegetation communities in the watershed (due to grazing pressure by ungulates) have been primarily the result of cattle use. Cattle grazing may cause shifts in composition due to continuous, repeated, and sustained grazing use on selected, preferred herbaceous species through their peak growth periods (primarily on cool-season bunchgrasses during late spring and early-to-mid-summer). The principle example of this are areas where desirable bunchgrass species have been reduced and allowed expansion of less desirable species like rhizamotous wheatgrass.

The majority of the assessment area has undergone the implementation of various BMPs, to some extent, which promote the maintenance or enhancement of natural plant communities. The results can be readily observed in the form of higher density of native plants, higher ground cover, greater plant diversity, and higher vigor and nutritional value of individual plants. In some cases, multiple practices and improvements were necessary, while in others, only minor adjustments to grazing management have been or are required. Direct changes to grazing timeframes, including adjustments to duration, intensity, and season of use, have been implemented to remove constant, repetitive pressure on key forage communities during the heart of their growth period. Rotational grazing schedules that include deferment and recovery periods

allow for preferred vegetation species to concentrate energy reserves towards vegetative growth. Upland water developments, including small stockponds and reservoirs, water wells, spring developments, and pipeline systems have led to better overall distribution of livestock use and facilitate grazing rotations and pasture systems. Fencing has been implemented to control livestock movement, allowing rotational grazing systems, and better distributing livestock use. Finally, vegetation treatments have been applied to limited areas within the watershed in order to introduce, or in some cases accelerate, the rate at which vegetation communities evolve and develop towards different seral stages. Very seldom (if ever) are vegetation treatment projects initiated with the objective of *converting* vegetation permanently to another type, but instead are intended to set the existing community back to an earlier seral stage and stratify the overall age class and structural variation. Treatment of (mostly) shrub stands can also be used to improve livestock distribution by removing impediments to animal movement and making the forage more accessible, and through increased forage quality and herbaceous content (through the removal of competition for nutrients and moisture). Overall, livestock management has been improved through the use of rangeland improvements and more intensive management without resorting to grazing exclusion, complete rest, or reducing permitted use. Although further refinements in grazing management may be necessary, these are primarily directed at achieving riparian/wetland objectives, rather than upland plant objectives.

Wildlife use in the assessment area varies with season, and tends to impact different components of the vegetation communities than does domestic livestock use. Pronghorn antelope primarily affect low elevation sagebrush and saltbush steppe habitats across the majority of the region, with studies showing winter diets comprised of up to 97 percent Wyoming big sagebrush. They usually congregate in larger herds during the fall and winter, which can lead to higher concentrations of use on crucial winter habitat. During the spring and summer they move around in smaller groups with few, concentrated impacts to vegetation. Mule deer also primarily use shrubs during the fall and winter, but require a more mixed diet of sagebrush and mountain shrubs, including bitterbrush, snowberry, serviceberry, chokecherry and mountain mahogany. During the spring and summer, deer eat more forbs with some grass and shrubs, and generally stay in small groups throughout the year. They are primarily found around the Atlantic Rim and Ferris-Seminoe Mountains with small, isolated populations in the Great Divide Basin. Impacts from mule deer use are most visible on mountain shrubs, particularly bitterbrush. Elk may impact through their use both the herbaceous and browse components of the communities, usually at higher elevations throughout the year (dependent on the severity of winter weather). Their areas of use have shifted over the last twenty years following changes in grazing management and vegetative treatments. Elk use north of the Ferris Mountains during the winter is more concentrated along lower Rush Creek and the south side of the Sentinel Rocks, compared to greater use in the past closer to the mountains near the Arkansas and Cherry Creek drainages, following changes in cattle management. Use by elk is expanding west from Atlantic Rim following both prescribed burn treatments and cattle management changes. In this area, burns have treated enough aspen acreage, so that the elk have not negatively impacted the resprouting plants. Although big game herd numbers are at or near objective, the numbers of animals utilizing the habitat probably has less effect on the vegetation than does the overall age class uniformity and maturity of the stands. However, animal use is an important factor in the health and ecology of important stands of shrubs, particularly mountain shrubs and basin and mountain big sagebrush. As the individual plants reach a stage of over-maturity and decadence, annual vegetative production decreases, and as the current and/or portions of the previous years' growth is removed, the plants become more and more hedged, further deteriorating overall stand health. New, juvenile plants are removed quickly if they are available, due to the higher palatability and/or nutritional content, leading to an overall loss of productivity and further aging of the stand. Additionally, as stands age, rival vegetation surrounding the shrubs, such as junipers, tends to

spread into the shrubs, out-competing them and shifting the overall community composition. Management changes that would focus on stratifying shrub stands and diversifying overall community composition, stand age and structural class, and habitat production would focus on achieving a mixture of seral stages, benefiting all species of wildlife. Impacts by other wildlife species on vegetation are light to moderate and inconspicuous to the casual observer. At the current time, existing numbers of wildlife are not having negative impacts upon the vegetation resource.

Within the Stewart Creek and Lost Creek HMAs in the Great Divide Basin, wild horses become a third user of the vegetation resource in addition to livestock and wildlife. Historically, most wild horses in this area originated from horses that were turned loose or escaped from local ranchers. These wild horses would thrive and occasionally be rounded up by ranchers or townspeople for extra cash. Populations must have reached high numbers at times, based on different accounts. Bill Grieve spoke about when all the wild horses were rounded up on the north side of the Ferris and Seminoe Mountains, around 1926-28, totaling between 2,000 to 3,000 head. With few water holes and no wells yet developed in the Great Divide Basin, impacts from wild horses would have been concentrated around the existing sources of water. However, differentiating these from livestock use is not possible.

Actions and tools, which are specified for the management of wild horses are limited to the use of gathers and removals of a portion of the horse population on a continuing basis in order to sustain the population at the Appropriate Management Level (AML). The AML is determined to be a population level that can be supported by the available forage in conjunction with amounts removed by other uses, including livestock and wildlife. Since both of these wild horse herd areas were just reduced to the AML level in the last two years, it will be important to monitor vegetative trends to determine if current levels of use by livestock, wildlife and wild horses can be sustained. Besides the total amount of vegetation that wild horses use, there are other factors to consider. Similar to unmanaged cattle, wild horse distribution is uneven and concentrated around limited water sources. It takes place throughout the year, and more importantly, throughout the growing season, regulated only by availability of forage and water sources. As population levels rise above the AML level, as they did in recent years, impacts to forage, particularly bunchgrasses on sites with higher productivity, have risen. Utilization has been observed at moderate to high amounts in areas where little use was made previously due to the relatively remote location and longer distance to water sources. Vegetation surrounding limited water sources is grazed more intensively by both livestock and wild horses. Where livestock operators pump water wells for their livestock, some use by wild horses is also drawn away from the natural water holes. The BLM also moves a solar pumping system between three wells located west, north and east of Stewart Creek to help better distribute the use made by wild horses. Some of the effects observed within the HMA include disturbance of the ground surface and increased bare ground, more annual forbs, and lower vigor, production, and density of grasses in upland plant communities. Due to the combined grazing effects from domestic livestock and unrestricted wild horse use, it is difficult to determine which use most impacts the vegetation. Actual use by wild horses within the Stewart Creek HMA in 2000-2001 was equal to that made by livestock in the same area.

The at-risk aspect of upland vegetation communities in the assessment area, particularly around the Ferris-Seminoe Mountains, centers on the late seral stage of development that the vast majority of sagebrush and mountain shrub stands and woodlands have reached without disturbance or stratification. This can be observed in the predominance of even-aged and structural classes of the dominant shrub species that are mature to decadent. As noted previously, the predominant overstory shrub or woodland community can be considered

monotypic, with few, if any, instances of early or mid-seral communities interspersed within the landscape. Although a portion of any vegetation community should be expected to exist in a mature to decadent (or late seral) stage in order to be considered healthy and properly functional, there also must be a mixture of early to mid seral components mixed throughout, on a community or landscape scale. As dominant shrub and/or woodland vegetation continues to age and decline, individual plants or portions of them die and are not replaced by juvenile seedlings or tillers, and understory vegetation decrease in density, abundance, and diversity. As the production and vigor of these grasses and forbs decreases, less vegetation remains after growth resulting in less litter above and below ground and reduced overall nutrient cycling. Less desirable species such as coniferous trees in aspen stands and limber pine or junipers in sagebrush and mountain shrub stands continue to encroach and out-compete the more desirable plants. Vegetation values for ground cover, big game habitat, and livestock forage, decrease, putting the entire community into an "at risk" category. Additionally, the communities can be considered at risk due to the homogeneous and continuous nature of these dense, mature shrub stands, because the potential exists to lose large blocks of vegetation to catastrophic wildfire events, as few vegetation transition-type fuel breaks are located (or placed) within landscape vegetation communities.

Where portions of sub-basins have been treated with prescribed burns (Separation Creek drainage in the Fillmore allotment), monitoring has shown that with managed post-treatment use the overall health of herbaceous vegetation is higher, with higher plant densities and increased species and cover diversity (pictures 54-1, 54-2, 54-3, 54-4). Existing grasses and forbs are the most obvious species to benefit, and uncommon, early seral species like cotton horsebrush, Oregon grape, and wild hollyhock appear and increase on treated sites. Desired grazing species like green needlegrass and oniongrass are released to expand in abundance following the removal of the shrub canopy through burning and proper post-treatment grazing management. Because most treatments are conducted to obtain a mosaic pattern, shrub age classes are diversified between older, mature-to-decadent shrub stands interspersed within and around areas set back to an early seral stage, which include many juvenile to young plants. Although aerial canopy cover from older shrubs can be quite high, the nutritional value and production drops, and overall ground cover percentages remain low and continue to decline over time as understory species are shaded by the larger shrubs and out-competed for nutrients and water. These areas when compared to treated sites exhibit lower species diversity and lower herbaceous cover, production, and nutritional value for livestock and wildlife forage.

The lack of treatments and aggressive suppression of all natural fire around the Ferris-Seminoe Mountains has also affected the health of aspen stands by allowing them to over-mature and become decadent and diseased, with total loss of stands to encroachment of coniferous vegetation (subalpine fir, limber and lodgepole pine, and Rocky Mountain juniper) and sagebrush (picture 54-5). Bleeding rust is present in most stands, primarily affecting larger trees, but spreads through the root systems to younger trees in the same clone (picture 54-6). Removing these larger, diseased trees can prevent the bleeding rust from spreading to young trees. It is estimated that less than ten percent of the aspen stands that were present during the early half of the 20th century continue to exist today. As the older trees die or fall to wind events, they are not replaced by juveniles or suckers, and eventually, the stand dies or is reduced to a few remnants, dominated by conifers and big sagebrush. Of course, historical season-long livestock grazing and elk use has concentrated grazing on the seedlings in the past, but relatively recent implementation of rotational use and other upland grazing management tools currently mitigates these impacts, leaving a lack of stand replacement events as the missing element to enhanced aspen health. Prescribed burns are being planned to restore aspen health by stimulating sucker regeneration and removing other plant species that compete with aspen.

Wildfires do not play a large role in the region of this assessment. A limited number of natural ignitions occur annually and are aggressively suppressed. In the last twenty years there have been two wildfires between 500 and 1000 acres in size, one in the Haystacks and one in the Seminoe Mountains. Small 'tree' fires up to twenty or thirty acres are the average size. The last large fire in the area was on Ferris Mountain in the late 1940s, and it burned several thousand acres. In the area around the Ferris-Seminoe Mountains there has only been one prescribed burn in 1994 that covered about 300 acres. There have been no other significant vegetation treatments undertaken in this area, although an ecosystem plan for the Ferris' with multiple vegetative treatments over the next few years is currently being developed. The lack of periodic stand-replacement type events has allowed sagebrush and mountain shrub species to reach a level of over-maturity and decadence, and limber pine/juniper woodland communities threaten to encroach on and overwhelm portions of the shrub lands. In many cases, understory grasses and forbs (and in the case of juniper woodlands, the understory shrubs as well) have been suppressed by the large, mature shrubs resulting in lower vigor, density, and diversity of these species.

Recreation primarily takes place during the late-summer and fall months as hunting (mid-August through November). Springtime recreational uses such as shed-antler hunting continue to increase at an accelerated pace, while limited summer use occurs throughout the area.. Associated with these uses are an ever-increasing number of roads, trails, and tracks, which wind through all of the vegetation types and are restricted only by topographical impediments. However, in the flat to gently sloping land common to the Great Divide Basin, there are few effective topographical impediments. Even in the Ferris Mountain WSA, people attempt to drive ATVs as far up steep slopes and lookout points within the WSA wherever they can. Commercial moss rock collector's are also creating similar impacts to those just described.

Loss of vegetation that occurs due to the proliferation of roads and trails, although proportionally smaller than other impacts, tends to be more evident and can be equally severe on a small scale because all vegetation is totally removed along the entire area of impact. Even improved roads, if not adequately designed and/or drained, lead to vegetation loss/community conversion on adjoining lands through increased erosion/sedimentation immediately along the route and introduction of less desirable species from disturbance along the route. As noted in the watershed health section, there is a need for further work on many improved roads to reach an adequate level of improvement practices (gravelling, additional culverts, wing-ditching, water-bars) to minimize or eliminate overland flow alterations and vegetation species movement/colonization. Equipment used to sustain or improve highly traveled routes should be maintained in a weed-free status, as noxious weed and non-native invasive species infestations have arisen in areas of recent maintenance. Recreational use of roads and trails, and particularly the pioneering of new trails by illegal off-highway driving is increasing, including problems stemming from hunting, joy-riding and the increasing popularity of antler hunting in the late winter and spring (picture 55-1). Greater availability of disposable wealth has led to greater availability of all terrain vehicles (particularly 4-wheelers) and pickup trucks, which have exacerbated this impact, particularly in areas with easy access and proximity to towns, but also in remote portions of the watershed.

Reclamation standards, and their application (or lack thereof) directly affect the vegetation through the watershed by allowing or precluding an unoccupied niche, which less desirable increasers or invader species attempt to fill. Poor reclamation practices, found in various portions of the watershed, mostly on developed and/or capped well pads, lead to an increase in weedy species, mostly halogeton and cheatgrass, which thrive and spread to surrounding rangelands. Good or even adequate vegetation reclamation, most notably on pipeline routes and BP America well pads, results in little unoccupied space for infestation, high forage production, and the

proliferation of desirable introduced or annual species which tend to remain within the project's right-or-way area and only affect the surrounding rangeland in a limited manner.

6) Recommendations:

At the present, the review of upland vegetation conditions in the Great Divide Basin reveals generally good overall community health. Natural ecological and biological processes appear to be functioning adequately overall, although concerns about current, and especially near-future, functionality of certain community types remain. Specifically, the review group has determined that the majority of upland vegetation communities are properly functioning in relation to the seral stage to which they have evolved. Several specific communities, however, are becoming rare (aspen) or elicit concerns due to their uniformity of age and structural class, and the imminent onset of over-maturity to decadence (big sagebrush and mountain shrub stands).

Aspen stands in the Ferris-Seminoe Mountains area do not meet the standard for upland vegetation health due to decadence, disease, and decreasing occurrence and acreage due to encroachment by conifers. They occur next to seeps and drainages at lower elevations, as separate stands along the base of the mountain, and intermixed with conifers up on the mountain. The current acreage of aspen habitat in this area is about 500 acres. Livestock grazing is a component in the management scenario of these plant communities, but it is not the principle factor in non-attainment of this Standard.

The health of big sagebrush and mountain shrub stands are a management issue to resolve, as is the disease and decadence found in conifer woodlands on the Ferris and Seminoe Mountains. However, these communities are not at the brink of being lost within this ecosystem. Implementation of treatments, improved grazing management, or implementation of other BMPs can address the problems identified in these shrublands and woodlands.

In spite of these concerns, the diversity, vigor, productivity, and overall amount of upland vegetation within the watershed, as well as the cooperation exhibited by the majority of livestock permittees towards grazing management, suggest that no insurmountable vegetation health problems are evident on a significant scale in most vegetation communities. Due to the existing conditions and general vegetation community heath on uplands, and the generally small number of management issues that need to be dealt with, it is determined that the remainder of the Great Divide Basin Report Area is meeting Standard #3 – Upland Plant Health. The following recommendations would expand upon the successes already achieved and help to meet desired resource conditions in the future.

Continue to implement or manage using BMPs for livestock grazing. These practices utilize, but are not limited to, the control of season, duration, intensity, and distribution of livestock use to meet desired resource objectives for upland vegetation as well as riparian habitat. Specific dates or timing of use must be decided on a case-by-case basis specific to the management unit and/or site limitations. Methods that can be used to achieve resource conditions include, but are not limited to, livestock control by pasture fencing or herding, water developments, vegetation treatments, and/or the manipulation of livestock turn-out/removal dates.

Vegetation treatments designed to modify the age and structural composition of predominant shrub stands and stratify the seral stage mix within stands should be expanded throughout the assessment area. The ecosystem plan for the Ferris-Seminoe Mountains areas should be completed and implemented as soon as possible (in the next year). Where treatments are utilized to improve the health and productivity of sagebrush and sagebrush/mountain shrub communities,

they should attempt to promote juvenile, palatable shrub seedlings within the community in addition to increasing the herbaceous component. Where management units include decadent or dying (shrinking) aspen stands, treatments can incorporate design features to remove old, decadent, and diseased trees (stand replacement), or at a minimum, remove understory vegetation and litter (with low-intensity, creeping flame fronts) in order to promote suckering of new clones and turnover of the stand(s). The use of wildland fire for resource benefits should be promoted on Ferris Mountain where controlling a prescribed burn may be nearly impossible. Removal of encroaching species (limber pine and juniper in shrub stands and mixed conifers within aspen stands) in manageable vegetation communities can be accomplished through the use of traditional, controlled-intensity prescribed burns removing vegetation in a mosaic pattern. Treatment methods and post-treatment management of burns designed to improve watershed health should (at least initially) maximize herbaceous vegetation and litter in order to provide healthy, productive forage and habitat for livestock and wildlife. Treatment and management objectives should strive to focus on and address changes and improvements to the predominant vegetative community rather than expected secondary effects (positive and negative) to narrowly-defined rangeland "users" (e.g., wildlife vs. livestock burns). Polarization from user groups and single resource advocates can be more effectively avoided if objectives specifically address rangeland vegetation health issues, rather than focus on what can be construed as single species or single use management. On a long-term basis, treatments and pre/post-treatment management should be designed to promote healthy, diverse, natural rangeland conditions rather than the creation of homogeneous monotypical communities covering large tracts of land.

Wild horse populations in the Lost Creek and Stewart Creek HMAs should be maintained at the AML. Bands of wild horses occupying rangelands outside the HMA should be removed or herded into the HMA. Monitoring of impacts to the vegetation within the HMA should attempt to determine what effects wild horses have on their habitat when maintained at the desired population level and to what extent these effects are compatible with other multiple use activities occurring in the area. Additional water sources should be developed to reduce the dependence on existing water sources and the long duration use by wild horses around these sites to improve vegetative vigor, cover, and diversity.

Identify and correct problems with improved roads which affect vegetation community health and/or composition, including the implementation of mitigation and/or improvements to improved travel routes that will modify overland flow regimes and erosion/deposition patterns which influence the surrounding and adjacent vegetation communities. Pioneered and/or illegally located two-tracks or trails should be dealt with on a more location-specific basis for key problem areas. There is a need throughout the watershed to remove duplicate/redundant motorized vehicle travel routes, as well as unimproved routes creating vegetation or watershed-damaging disturbance. The scale of such management should be dependent on the issues involved. Enforcement of travel regulations, including ticketing of illegal off-highway use and increasing reparations for violations should be implemented throughout the watershed. Enforce existing stipulations on commercial activities like moss rock collecting which do not allow off-road vehicular travel as a part of the permit.

Oil and gas extraction companies should be held to established reclamation standards on active and abandoned (dry hole) well pad sites in order to mitigate construction impacts to the disturbance site and to surrounding rangelands. Additionally, reclamation of former well-site access roads should be stringently inspected and enforced. Seed mixtures should promote a mix of desired species, including a balance of grasses, forbs, and shrubs. Construction and reclamation equipment should be thoroughly cleaned and inspected prior to movement between

work sites to ensure that undesirable vegetation species are not carried and spread throughout the watershed.